LOCKERBIE ACADEMY

TRANSPORT UNIT

SPEED

S1-S3 Road Safety & PHYSICS

LOCKERBIE ACADEMY TRANSPORT UNIT

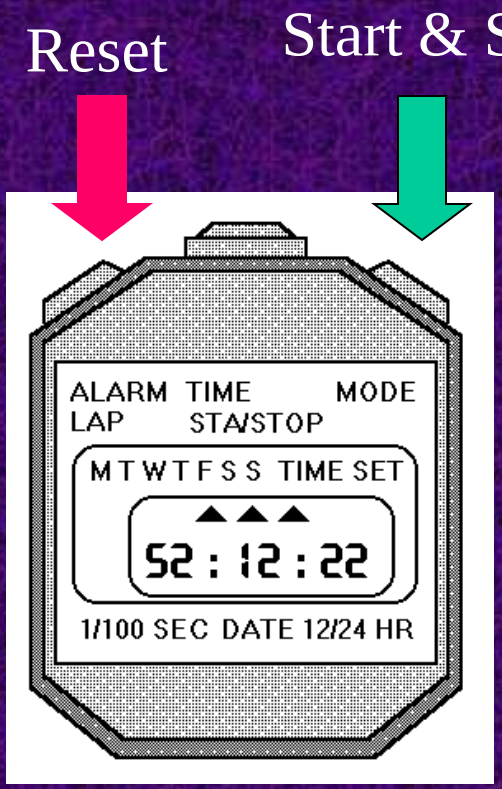
- We plan to find out and understand about the following terms
  - ✓ distance
  - ✓ displacement
  - ✓ speed
  - ✓ velocity
  - ✓ instantaneous/ average/ uniform/ speed
  - ✓ time & at rest

Speed, Distance & Time

Back to mind map

Reading the stopclock

- The stopclock display can be a bit confusing.
- A number that looks like this: 0:0234 means 2.34 seconds.



Did you know?

- Excessive speed contributes to 12% of all injury collisions, 18% of crashes resulting in a serious injury and 28% of all fatal collisions
- This means that around 1,000 people are killed each year on Britain's roads, and over 6,000 are seriously injured, because drivers and riders travel too fast.

Highway Code Rule 103

You MUST NOT exceed the maximum speed limits for the road and for your vehicle. Street lights usually mean that there is a 30 mph speed limit unless there are signs showing another limit.

What do you think?

Find out the normal speed limits for different types of roads and different vehicles. Why do some vehicles (for example, heavy goods vehicles) have lower limits?

Why are speed limits necessary? What would happen if drivers were allowed to drive at any speed they wanted? Would they all choose the same speed on a particular road? Would they choose speeds that were safe for pedestrians and cyclists?

How do higher speeds make crashes more likely? How do higher speeds make collisions more serious?

Speeding is not just exceeding the speed limit. It is also driving within the speed limit but too fast for the conditions (known as 'inappropriate speed'). Describe some situations where it is not safe to drive as fast as the speed limit.

Discussion Points

Stopping Distances

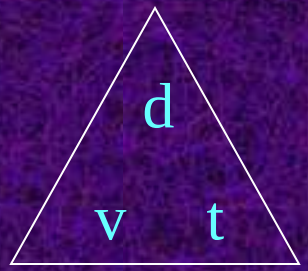
The faster a car is travelling, the longer it takes to stop. At just 30 mph, a car travels 44 feet (about 3 car lengths) each second.

Using the Highway Code, make a chart showing the differences in stopping distances between various speeds in between 20 mph and 70 mph. If a driver reacts slowly, the stopping distance will increase. What else increases stopping distances?

As well as being dangerous itself, going too fast also makes other types of driving more dangerous, e.g. driving too close to the vehicle in front. Make a list of types of bad driving that are made even worse at higher speeds.

Speed

$v = d \div t$



$$v = \frac{d}{t}$$

$$Speed\ (\text{metres/second}) = \frac{Distance\ (\text{metres})}{Time\ (\text{second})}$$

Examples using the Speed Formula (Showing full working):

1. The sprinter ran 100 metres in 10 seconds. What was his speed ?

$$Speed = \frac{Distance}{Time} = \frac{100\ m}{10\ s} = 10\ m/s$$

- In Physics we show the divide by sign as a line and say "over"

$$\text{speed} = \frac{\text{distance travelled}}{\text{time for the journey}}$$

$$\overline{v} = \frac{d}{t}$$

where v=speed, d=distance and t=time

Your Team Challenge

Each member of your team must drive the course with their vehicle. They must NOT stray off the track or they have to return to the start.

Your Team Challenge

You must time how long it takes each member to complete the journey and measure the distance travelled along the track.

Record each team member's time and calculate the average speed for each journey.


P
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YOUR TASK.

TASK

Working in teams you need to:

1. Measure the DISTANCE that the car will travel along the pre-defined course.
2. Record this value on your worksheet.
3. Time how long each person in the group takes to complete the course.
4. Record this value on your worksheet
5. Record as tally marks on your worksheet every time each person in the group leaves the track

WORDBANK

- Vehicle
- A thing used for transporting people or goods, especially on land, such as a car, truck, or cart.

WORDBANK

- Distance- is how far you have travelled. It is another name for length. It is measured in metres or during our road safety topic miles.

- Time- is how long your journey took. It is measured in seconds or during our road safety topic hours.

Additional Notes- For Printing only if repeat measurements required

- To find the average speed from your results
- Find the average time for the 3 runs (if the race was run 3 times)
  - Do this by adding the times for the three runs in the calculator, PUSH the = button on the calculator and then divide this answer by 3 (as there were 3 runs). Add this number to your table where it says average time)
- Find the speed using the formula
  - Speed = distance ÷ time
- Add this value of speed to your table.
- DO NOT give your average speed to more than 1 decimal place unless the value is very small.

WORDBANK

- Speed – how far you travel every second.

OR

- Speed is the distance travelled in unit time.
- In the lab our distances are measured in metres and our time is measured in seconds so our units of speed would be metres per second.
- In road safety we look at miles travelled every hour or miles per hour.

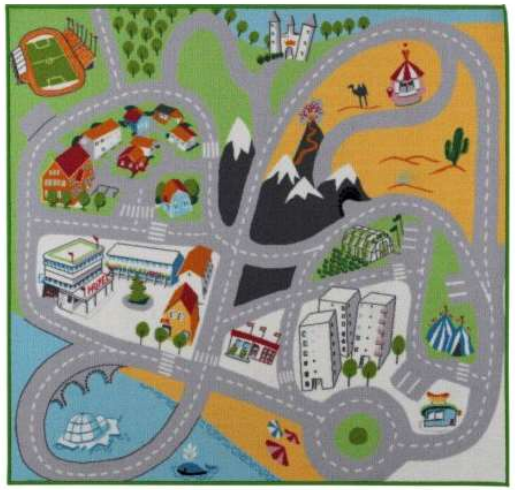
WORDBANK

- At rest- in Physics we use this term to mean not moving. We can also say the object is stationary.

- *It is not the same word as pens and pencils which are stationery!*

Let's try some examples

1. Matt's time for the course was 01:55:00. The course was 1.78m. What was Matt's speed around the course?



$$t = 00:01:55$$

$$= 1\min 55s = (1 \times 60) + 55s = 115s$$

$$d = 1.78m$$

$$v =$$

$$Speed = \frac{Distance}{Time}$$

$$v = \frac{d}{t}$$

$$v = \frac{1.78}{115}$$

$$\underline{\underline{v = 0.015m/s}}$$

AND THE WINNING TEAM IS

- FIXING your calculators

FIX allows you to fix how many figures after the decimal point should be displayed i.e. it fixes the number of decimal places you quote a value to. This is really useful if you suffer from calculator diarrhoea, but be careful you could end up with zero!

AND THE WINNING TEAM IS

- Calculate the average speed for each of your team drivers.

AND THE WINNING TEAM IS

- And the winner is……

Let's try some examples

- Let's try some more examples of speed distance and time and then in your groups we can do the domino challenge.

- But first let's look at how to set out equations

HOW TO LAY OUT EQUATIONS IN PHYSICS

http://www.youtube.com/watch?v=u7akhlAS5Ck

Check before you play!

IESSUU

- Information
- Equation
- Substitution
- Solution
- Units
- Underline

& remember no SECS in PHYSICS

$$Speed\ (\text{metres/second}) = \frac{Distance\ (\text{metre})}{Time\ (\text{second})}$$

2. The Porsche travelled at 40 m/s for 2 minutes. How far did it go ?

speed=40m/s
Time = 2 minutes = 120 second ← Information

$$Speed = \frac{Distance}{Time}$$ ← Equation

Substitution

$$Distance = Speed \times Time$$

$$= 40\ m/s \times 120\ s$$

Solution

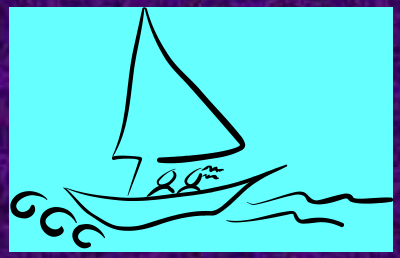
Units

$$= \underline{\underline{4800\ m}}$$

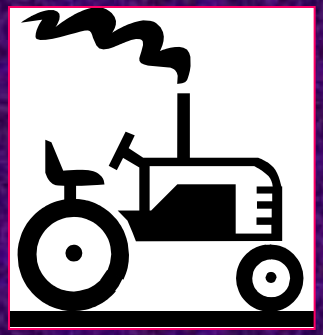
Underline

Let's try some examples

Work out the average speeds for the following journeys. Make sure you set out your working in the same way as the example above.



1. A boat travels 30 km in 3 hours.



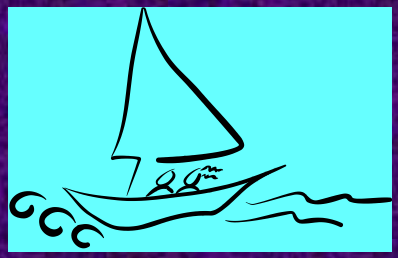
2. A tractor drives 18 km in 6 hours.

3. A frog jumps 25 metres in 5 seconds. (Take care with the units.)

4. A plane flies 600 km in 3 hours.

Let's try some examples

1. A boat travels 30 km in 3 hours.



$$Speed = \frac{Distance}{Time}$$

$$v = \frac{d}{t}$$

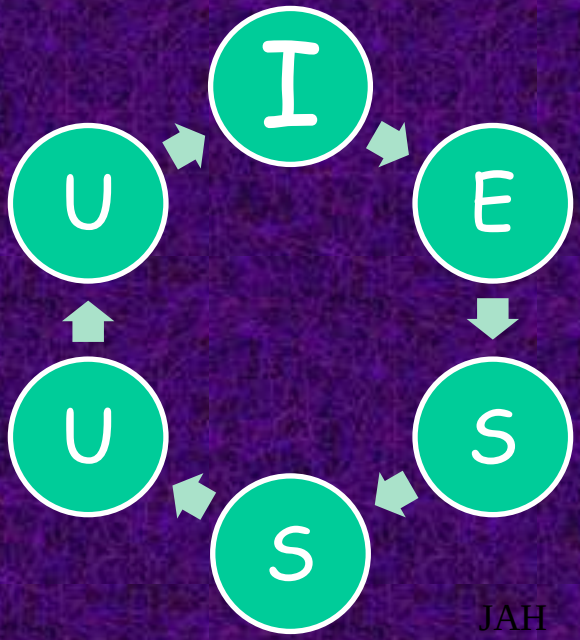
d= 30km

t= 3h

v=?

$$v = \frac{30}{3}$$

$$\underline{\underline{v = 10\ km/h}}$$



Let's try some examples

2. A tractor drives 18 km in 6 hours.

$$Speed = \frac{Distance}{Time}$$

d= 18km

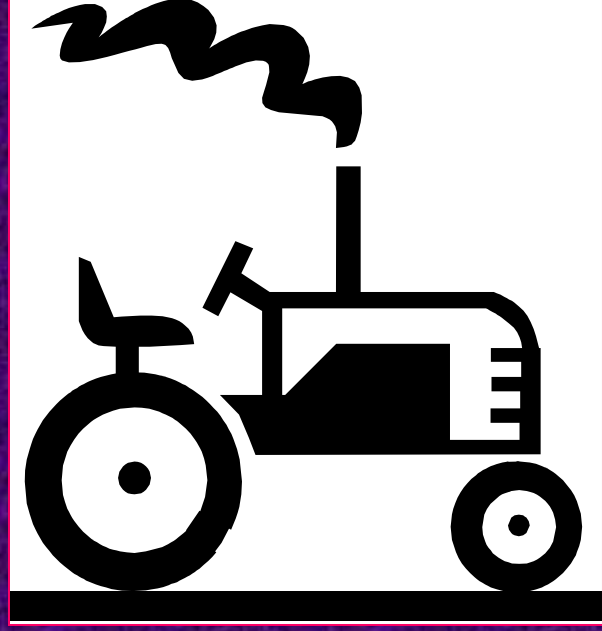
t= 6h

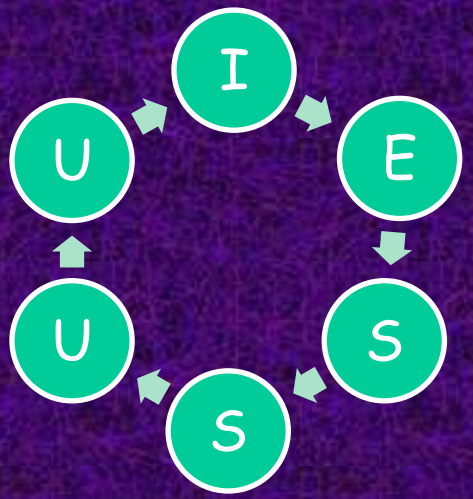
v=?

$$v = \frac{d}{t}$$

$$v = \frac{18}{6}$$

$$\underline{\underline{v = 3\ km/h}}$$





Let's try some examples

3. A frog jumps 25 metres in 5 seconds. (Take care with the units.)

$$Speed = \frac{Distance}{Time}$$

d= 25m

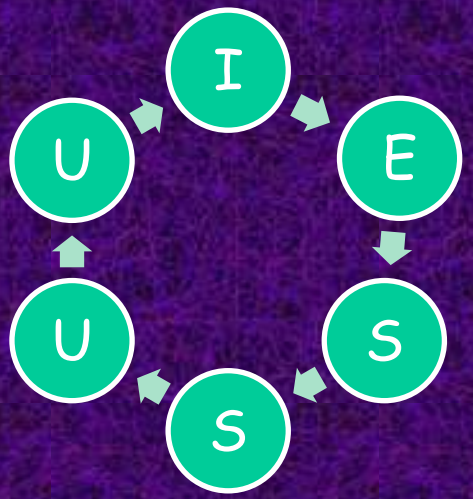
t= 5s

v=?

$$v = \frac{d}{t}$$

$$v = \frac{25}{5}$$

v=5m/s



Let's try some examples

4. A plane flies 600 km in 3 hours.

$$Speed = \frac{Distance}{Time}$$

d= 600km

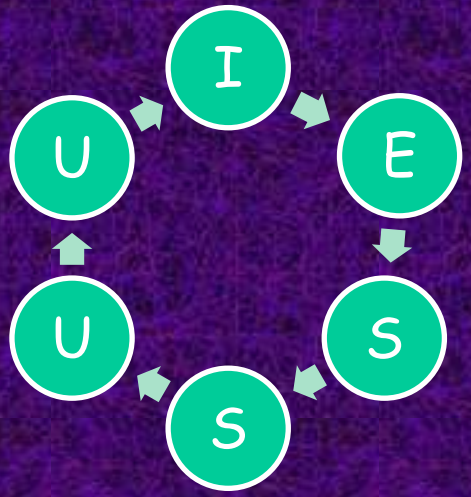
t= 3h

v=?

$$v = \frac{d}{t}$$

$$v = \frac{600}{3}$$

$$\underline{\underline{v = 200\ km/h}}$$



IN YOUR MATHS SECTION WRITE OUT THE FOLLOWING EXAMPLE

- Tony walks 40m in 30s what is his average speed?

v=?, t=30s, d=40m

- speed=distance/time
- speed=40/30 = <u>1m/s</u>

IN YOUR MATHS SECTION WRITE OUT THE FOLLOWING EXAMPLE

- You could write 1.3m/s, 1.33m/s or 1.333m/s and get the mark. If you write 1.33· m/s or 1 1/3 m/s or 1.33333m/s you lose the mark for the answer! This is because you have used TOO MANY SIGNIFICANT FIGURES.
- Mrs Hargreaves calls this "calculator diarrhoea"! and you can FIX it!!!!

Word

ools Table MathType Window Help

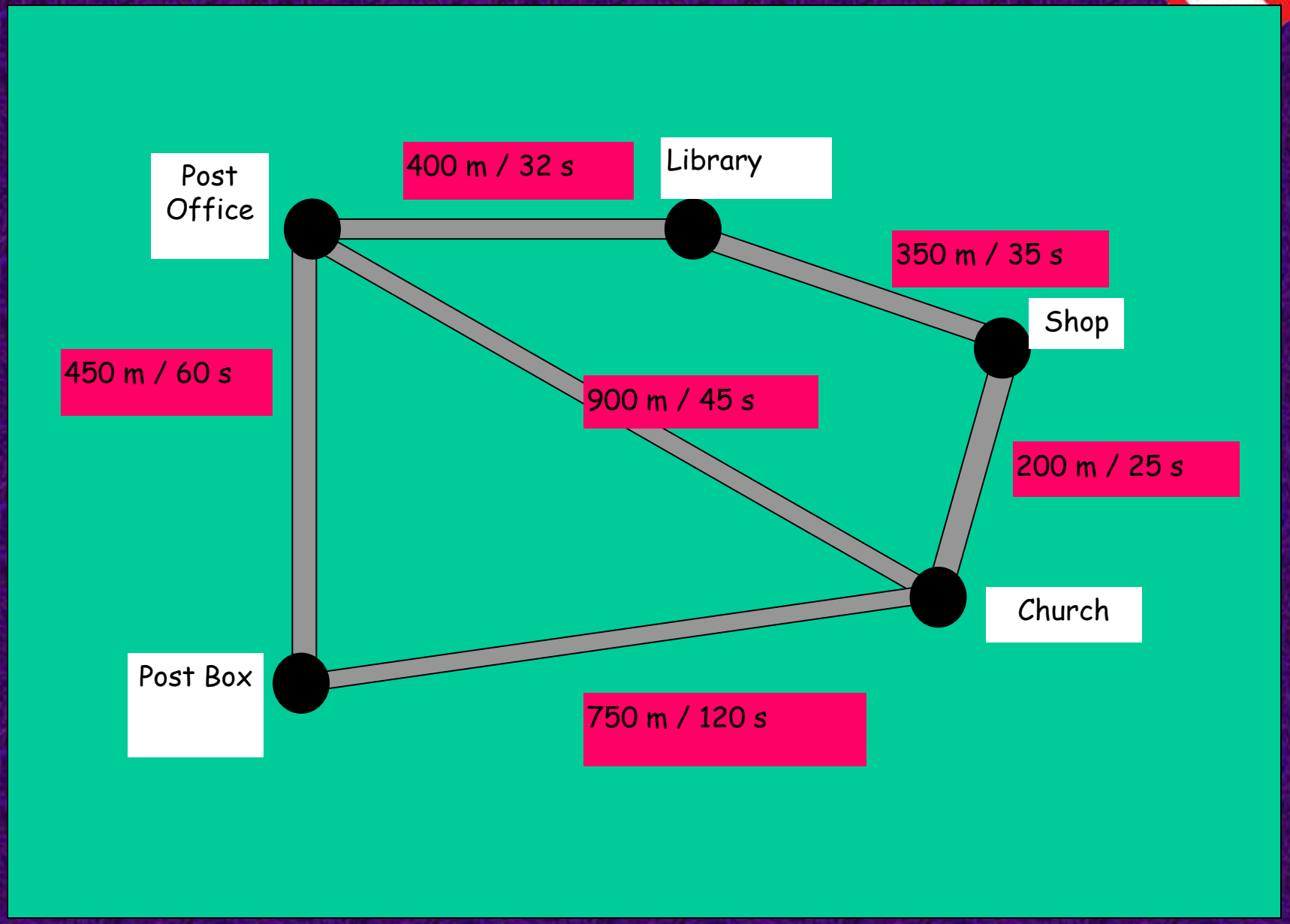
Answer = **17.5 m/s**	Space for working	Answer = **5s**	Space for working
average speed = ? distance = 500 metres time = 5 seconds		average speed = ? distance = 15 000 metres time = 25 seconds	
Answer = **45 m/s**	Space for working	Answer = **100 m/s**	Space for working
average speed = ? distance = 10 metres [illegible]		average speed = ? distance = 45 metres [illegible]	
Answer = **0.12 m**	Space for working	Answer = **600 m/s**	Space for working
average speed = ? distance = 750 metres time = 500 seconds		average speed = ? distance = 540 metres time = 12 seconds	
Answer = **1.5 m/s**	Space for working	Answer = **18 m/s**	Space for working
average speed = 12 metres per second distance = ? time = 6 seconds		average speed = 0.001 metres per second distance = ? time = 120 seconds	

SpeedDominoes

At 15mm Ln 2 Col 1 REC TRK EXT OVR English (U.K

Jennies Stuff | Casio FX-83... | Movement le... | vdt proble... | Microsoft Po...

THE POST VAN AND AVERAGE SPEED.



Journey	Average Speed
Post Office → Post Box	
Post Office → Church	
Post Box → Church	
Library → Shop → Church	
Post Office → Post Box → Church	
Post Office → Church → Shop → Library	